
User Manual

LDM 40 A

Version 2.5



Dear User

You are advised to read this User Manual carefully before you start using the LDM 40 A laser distance measurement module.

This is necessary to ensure that you will be able to utilise all the capabilities which your new acquisition provides.

This technology is subject to continuously ongoing development.

Editorial deadline: August 2004

Manual Version: V 2.5

LDM 40 A Firmware Version: V1.04

NOTE

Appropriate care was used in compiling this document. No liability will be accepted in the event of damage resulting from a non-compliance of the information that is contained herein.

Table of Contents

1. General	4
2. Safety Instructions	5
3. Performance Data.....	7
4. Working Principle.....	9
5. Setup	10
6. Interface Cable Wire Assignments	12
Shield and Grounding.....	13
Termination of RS 232	13
7. Limiting Values for Voltages.....	14
8. Starting Up	15
9. Parameters	16
10. Functions	22
Command for Distance Measurement	22
Output and Input.....	23
11. Transmission Protocol	25
12. Error Messages	26
13. PC Interface Cable (Option)	27
13. Service and Maintenance	28

1. General

The LDM 40 A laser distance measurement module is designed for mobile and stationary distance measurement.

Particular features are:

- Operation under extreme outdoor temperatures with high accuracy and great reach
- Great range of operating voltages (10 V= to 30 V=) from on-board vehicle supply, a direct voltage industrial supply net or a DC power pack
- Small stable power consumption <1.5 W (without I_{Alarm})
- Long distance measurement, and more than 100 m reach with additional reflectors¹ mounted onto target (depending on reflectance and environmental conditions)
- Simple sighting with visible laser beam
- Flexible extendible interface cable for voltage supply, bi-directional data interface, switching output and analog output
- Input of commands for available measuring functions and output of measured readings via PC or laptop
- Switching output and analog output are separately programmed and with different parameters
- Adjustable distance barrier with hysteresis sets switching output
- Measured values are displayed in meters, decimetres, centimetres, feet, inches, etc. due to free scaling
- Option for remote triggering of measurement from external trigger device

¹ 3M, Type 3270, 3290, 5290

2. Safety Instructions

These safety and operating instructions should be carefully read and followed during operation and handling of the LDM 40 A.



There is danger from laser radiation or electrical shock! For repair work, the LDM 40 A may not be opened by anyone other than Manufacturer personnel or expressly authorised and duly instructed persons. Please note that dangerous high voltage and laser radiation is present in the inner product space.

Compliance with the prescribed operating conditions is necessary.

Failure to observe advice or information contained herein or non-conforming usage of the LDM 40 A may cause physical injury to operating personnel or material damage to the measuring module.

To operate the LDM 40 A, use only 10 V to 30 V direct voltage supply in all cases.

Important operating advice

To be able to fully utilise the system's capabilities, you should strictly follow these rules:

- Do not operate the module if there is fogging or contamination on optical parts.
- Do not touch the module's optical parts with bare hands.
- Use caution when removing dust or soiling from optical components.
- Prevent exposure to shock impacts during transportation and operation.
- Prevent overheating of the module. Do not expose the module to direct sun radiation while it is stored in a motor vehicle.
- The LDM 40 A is splashproof and dustproof as required under IP 65 internal protection standards.

- The LDM 40 A laser distance measurement module is a class 2 laser product under DIN EN 60825-1:2001-11.



Warning:

There is class 2 laser radiation when the cover is removed. Do not look into the beam!

3. Performance Data

Measuring range ² :	0.2 m up to 30 m with natural surfaces, more than 100 m achievable depending on target reflectance
Measuring accuracy ³ :	± 2 mm under defined measuring conditions ⁴ , ± 3 mm (+15 °C up to +30 °C), ± 5 mm (-10 °C up to +50 °C)
Meas. value resolution:	0.1 mm, user scalable
Repeatability ⁵ :	± 0.5 mm
Measuring time:	0.16 up to 6 s or 0.1 s (10 Hz) on white surface
Laser divergence ⁶ :	0.6 mrad
Operating temperature:	- 10 °C to + 50 °C
Storage temperature:	- 20 °C to + 70 °C
Shock resistance:	10 g / 6 ms persistence shock DIN ISO 9022-3-31-01-1
Supply voltage:	10 V to 30 V direct voltage
Power consumption:	depending on operating mode < 0.4 W for standby, < 1,5 W for distance tracking
Data interface ⁷ :	RS 232/RS 422, baud rate: 2400 to 38400, format: 8N1 (fixed)
Digital switching output:	programmable switching threshold and hysteresis, "high-side switch", rated for max. load of 0.5 A

² dependent on target reflectance, steady light influences and atmospheric conditions

³ typical measuring accuracy under average conditions within specified measuring range

⁴ you should consult the Manufacturer or your local distributor!

⁵ dependent on target reflectance, steady light influences and atmospheric conditions

⁶ at 10 m distance the beam diameter is 6 mm, at a distance of 100 m it is 6 cm

⁷ convertible, conversion to be carried out by certified personnel

Analog output:	4 mA to 20 mA current output, programmable distance range limits, load resistance $\leq 500\ \Omega$, accuracy: $\pm 0.15\%$, Temperature drift: $< 50\ \text{PPM}/^\circ\text{C}$
Trigger input:	external triggering, 5 V pulse height, trigger flank adjustable, trigger delay adjustable
Eye safety class:	laser class 2 under DIN EN 60825-1:2001-11
Wavelength:	650 nm (visible)
Dimensions (L x W x H):	182 mm x 96 mm x 50 mm
Weight:	850 g
Internal protection class:	IP 65

4. Working Principle

The LDM 40 A works based on comparative phase measurement. To achieve this, it emits visible laser beams in different frequencies. The target being measured returns diffusely reflected light that is subsequently compared with a reference signal. Finally, a microprocessor uses the recorded phase shift to calculate a required distance with mm accuracy.

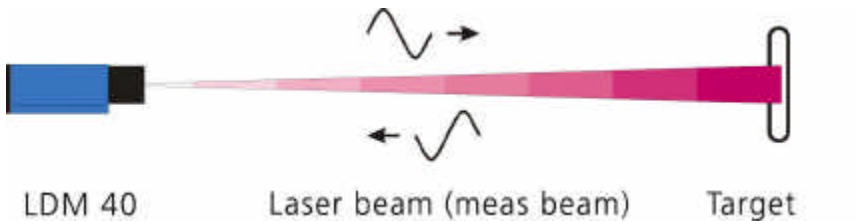


Figure 1 Working principle

A distance measurement can be triggered in different ways:

- manually at the PC with terminal program
- automatically after parameterisation of Autostart command
- continuously by selecting distance tracking mode
- remotely controlled with external triggering

For a description of these trigger options, refer to → sections 9 "Parameters" and → 10 "Functions" of this Manual.

5. Setup

The laser distance measurement module is shipped together with an interface cable (about 2 m in length) and a User Manual in a padded cardboard box which can also be used for safe transportation of the LDM 40 A.

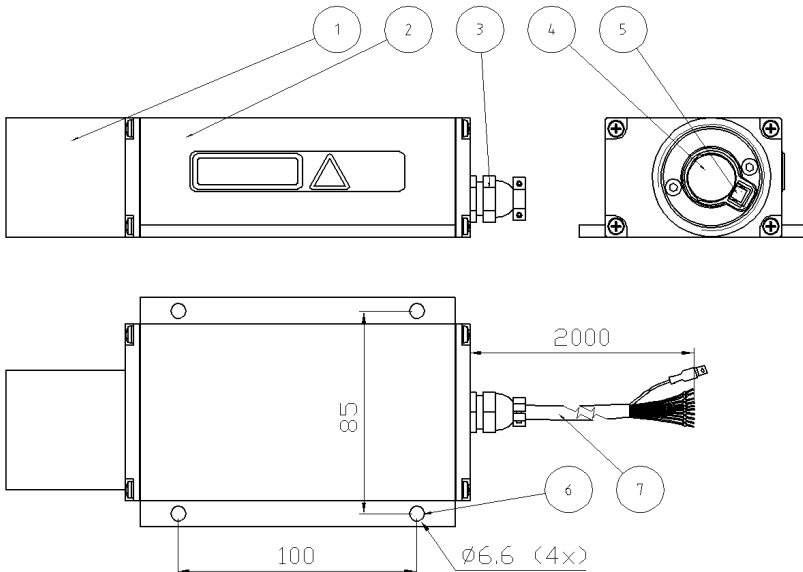


Figure 2 Technical drawing

1	Tube at front cover
2	Casing
3	Gland seal for interface cable in back cover
4	Receiver optics
5	Transmitter optics
6	Holes for mechanical attachment (four)
7	Interface cable

The casing consists of a robust, non-corroding continuously cast aluminum part with front and back cover, also non-corroding. The base plate contains four holes for mechanical attachment of the LDM 40 A.

To protect the optical components from dust, physical contact, mechanical impacts, etc., a choke is fixed to the casing. Depending on the customer's request, the LDM 40 A may be shipped with a tube of any greater length or with no tube at all⁸. In the event of unqualified tube removal, measurement can no more be warranted to function correctly! The back cover contains a gland seal port for the interface cable (2 m in length) as required by IP 65 standards.

Where local conditions necessitate a greater distance between the actual measuring location and the PLC / PC / voltage supply, the interface cable can be extended with a extra shielded cable⁹.

⁸ please get in touch with your contact person!

⁹ may deviate from interfacing specifications!

6. Interface Cable Wire Assignments



Caution: The cable ends are uncovered! It's the user's responsibility to prevent shorts!
The cable shield must be grounded with low resistance.

Interface cable wiring assignments are as follows:

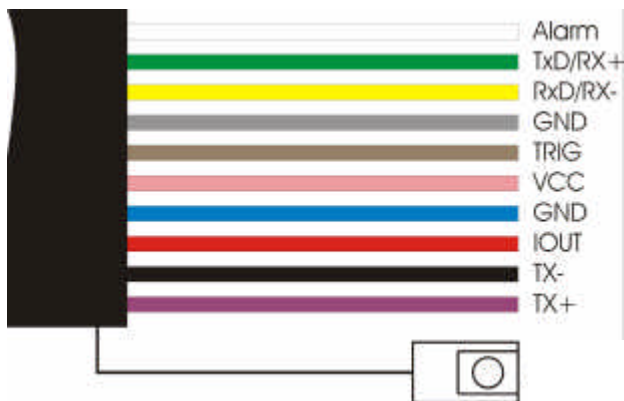


Figure 3 Interface cable colour codes

No.	Colour code	Designation	Function if RS 232	Function if RS 422
1	white	ALARM	Digital switching output	Digital switching output
2	green	TxD / RX+	RS 232 send data	RS 422 receive data +
3	yellow	RxD / RX-	RS 232 receive data	RS 422 receive data -
4	grey	GND	Ground potential	Ground potential
5	brown	TRIG	External synchronisation	External synchronisation
6	orange or pink	VCC	Supply voltage	Supply voltage
7	blue	GND	Ground potential	Ground potential
8	red	IOU	Current output	Current output
9	black	TX-	RS 422 send data -	RS 422 send data -
10	violet	TX+	RS 422 send data +	RS 422 send data +

The GND wires are internally combined to serve as reference potential for all voltage values specified below.

If data transfers are accomplished via RS 232, we recommend using cable 4 (grey, GND) as signal ground and cable 7 (blue, GND) as supply ground!

The limiting values for voltages, load rates and logic levels are identical with those specified for RS 232 or RS 422 operation.

All outputs are sustained-short-circuit-proof.

Shield and Grounding

The cable shield must be grounded with low resistance. For cable extension use only high quality shielded cable.

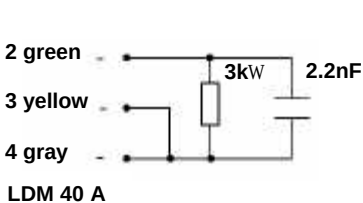
Carrier base and control box should have the same potential.

Potential differences are reason for electrical current and can cause EMC problems (no correct measurement function or “hang” of the gauge).

Is no potential equalization possible, mount the LDM 40 A isolated from the carrier base (use Nylon screwing and washers).

Termination of RS 232

(if not in use or with open terminal points)



Make sure you leave no data line end open. It will be highly sensitive to interferences (EMC).

A terminator circuit should be installed when the RS 232 is unconnected. This circuit must be provided by the customer (see diagram on the left).

Please keep the RS 232 norm. The maximal cable length of the RS 232 is 15 m. Use alternatively a RS 422 connection (use shielded twisted pair cable, maximum 300 m, termination resistor 100 Ω).

7. Limiting Values for Voltages

Input voltages:

Terminal point	Voltage	Comment
VCC	30 V	pole-reversal-protected
TxD	± 13.2 V	short-circuit-proof
RxD	± 25 V	short-circuit-proof
TX+	± 14 V	short-circuit-proof
TX-	± 14 V	short-circuit-proof
RX+	± 14 V	short-circuit-proof
RX-	± 14 V	short-circuit-proof
TRIG	± 25 V	short-circuit-proof

Output voltages:

Terminal point	Voltage	Comment
TxD	± 5.4 V	± 5 V at 3 k Ω load
TX+, TX-	≥ 2 V	differentially at 2 x 50 Ω load
Alarm	$\geq VCC - 2$ V	level depending on VCC

All outputs are sustained-short-circuit-proof.



Caution: Do not connect the current output IOUT to the power supply (10 .. 30 V). This will destroy the interface board!

8. Starting Up

Protect all cable ends against short-circuit effects before you turn voltage supply on!

Necessary cable connections must be established in accordance with table specifications on the previous page.

You require a PC with corresponding data interface port and a terminal program to perform start-up of the LDM 40 A.

For starting up, the LDM 40 A needs to be installed at the measuring site, aligned until pointing to a desired target, and kept stable in this position. The target should preferentially have a homogeneous white surface.



Caution: Do not use any retro reflectors!

Alignment of the LDM 40 A is facilitated by a laser beam¹⁰ that is visible and can easily be turned on at the PC.

Operating voltage supply must be connected to the corresponding ends of the interface cable. A pole-reversal protection is integrated to prevent the destruction of electronic components.

¹⁰ depending on ambient light and target conditions

9. Parameters

A comprehensive set of LDM 40 A configuration functions can be triggered at the PC. This variety provides the user with a broad range of potential applications.

By selecting ID[Enter] command, you may call up the menu with available setup commands.

LDM 40, s/n xxxxxx, V 1.04

```
DT[Enter].....distancetracking
DW[Enter].....distancetracking with cooperative target (10Hz)
DF[Enter].....distance measurement with ext.trigger
DM[Enter].....distance measurement
TP[Enter].....internal temperature [C]
SA[Enter] / SApp[Enter]...display/set average value [1..20]
SD[Enter] / SDxx[Enter]...display/set display format [d/h]
ST[Enter] / STxx[Enter]...display/set measure time [0..25]
SF[Enter] / SFx.x[Enter]...display/set scale factor
SE[Enter] / SExx[Enter]...display/set error mode [0/1/2]
                        0..Iout=const., ALARM=const.
                        1..Iout=4mA, ALARM: OFF@AH>0, ON@AH<0
                        2..Iout=20mA, ALARM: ON@AH>0, OFF@AH<0
AC[Enter] / ACx.x[Enter]...display/set ALARM center
AH[Enter] / AHx.x[Enter]...display/set ALARM hysteresis
RB[Enter] / RBx.x[Enter]...display/set distance of Iout=4mA
RE[Enter] / REx.x[Enter]...display/set distance of Iout=20mA
TD[Enter] / TDxx x[Enter]..display/set trigger delay [0..9999ms] trigger
level [0/1]
BR[Enter] / BRxxxx[Enter]..display/set baud rate [2400..38400]
AS[Enter] / ASdd[Enter]...display/set autostart command [DT/DW/DF/DM/TP/LO]
OF[Enter] / OFx.x[Enter]...display/set distance offset
LO[Enter].....laser on
LF[Enter].....laser off
PA[Enter].....display settings
PR[Enter].....reset settings
```

This allows you to optimally match the measuring module's performance to a particular measuring site environment and sighting task, which is achieved by intelligent parameterisation before measurement actually begins.

Your parameter setup will be preserved after the LDM 40 A has been shut down!

They can only be changed by selecting a new value or initialising the standard parameter set.

Parameter	Abbreviation	Relevance
Distance tracking	DW	Distance measurement
Mean value	SA	Distance measurement
Output format	SD	Distance measurement
Time to measure	ST	Distance measurement
Scale factor	SF	Distance measurement
Alarm centre	AC	Digital switching output
Alarm hysteresis	AH	Digital switching output
Range Begin	RB	Analog output
Range End	RE	Analog output
Trigger delay	TD	External triggering
Baud rate	BR	All serial communications
Autostart	AS	Behaviour on turning the LDM 40 A on
Distance offset	OF	Distance measurement
Error Mode	SE	Distance measurement

Mean Value (SA)

For a specified range, the mean value is obtained as follows:

$$\text{Mean value } x = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n} \quad (20)$$

Distance Value Output Format (SD)

For output of measured distance values, decimal (D) or hexadecimal (H) output mode can be selected.

The output mode has an influence on all commands that display a distance value.

Hex format: <SPACE>xxxxxx<CR><LF>, x=0...F, 1 mm resolution (SF1),

Negative numbers: two's complement,

Error: Exx<CR><LF>,

Dist.: 34.56789...m, SF 1, output: _008708<CR><LF>

Dist.: 34.56789...m, SF10, output: _05464F<CR><LF>

Time to Measure (ST)

The time to measure is directly conditional on the measuring technique. As a general rule: for target surfaces with poorer reflectance, the LDM 40 A takes longer to determine the distance with a given specified accuracy. With poor reflectance and too small a time to measure, an error message E15¹¹ may be output (among other possibilities). You should increase the setting for time to measure in this case.

The range of available time-to-measure values is 0 to 25. Please note: the greater the selected value, the greater will be time to measure and the smaller the measuring frequency.

An exception is 0 value. If set to 0, the LDM 40 A automatically determines the minimal time to measure!

The LDM 40 A comes with measuring time set to zero (ST = 0).

In addition, the user may configure a desired measuring frequency via the time to measure, for example, in order to limit the amount of data or for synchronisation purposes. The time to measure can approximately calculated using this equation:

$\text{Time to measure} \approx \text{ST} \cdot 240 \text{ ms (except ST=0)}$

Example:

The distance to be determined is 25 m. The target's reflectance is not ideal. If ST 2 is selected for time to measure, E15 will be output. You should choose a greater time-to-measure value in this case!

¹¹ see → section 12. "Error Messages"

Scale Factor (SF)

The scale factor multiplies a calculated distance value with a user-selectable factor to change resolution or to switch the output to a different unit of measure.

The scale factor setting has an influence on the output of the measured value, the distance offset (OF), the Alarm Centre (AC), the Alarm Hysteresis (AH), the Range Beginning (RB) and the Range End (RE)!

Resolution	Numerical measure	Unit of measure	Scale factor
1 mm	134.567	m	SF1
0.1 mm	1345.671	dm	SF10
0.01 Yard	147.162	yard	SF1.0936
0.01 feet	441.493	feet	SF3.28084
1 inch	52.979	100 inches	SF0.3937

Alarm Centre (AC)

Alarm Centre corresponds to the distance threshold of the switching output. Alarm Centre is input in meters. On negative or positive excession of the pre-set switching threshold, the alarm output will switch from „High“ to „Low“ or vice versa depending on the alarm hysteresis setting.

„High“ corresponds to about $VCC - 1\text{ V}$, „Low“ to 0 V.

Alarm Hysteresis (AH)

Alarm Hysteresis defines the response hysteresis of the switching output. Alarm Hysteresis settings are made in units of a meter. The value of a hysteresis setting corresponds to the delay in switching (in m), its mathematical sign describes the logic level.

Range Beginning (RB)

Range Beginning corresponds to the lower range limit of the analog output. Range Beginning settings are made in units of a meter. Range Beginning corresponds to a current of 4 mA. The value of RB must be lower then RE!

Range End (RE)

Range End corresponds to the upper distance limit of the analog output. Range End settings are made in units of a meter. Range End corresponds to a current of 20 mA. The value of RE must be greater than RB!



Caution: When setting the parameters RB and RE one must follow the rule that $RB < RE$. In any other case the state of the analog output will be in an undefined state!

Trigger Delay (TD)

Trigger Delay consists of two sub-parameters – the actual delay, i.e. the waiting time, and the trigger level.

Delay corresponds to the time from the point when a trigger signal is received to the moment at which a measured value is output. It may take on a maximum value of 9999 ms. The trigger level allows you to define if measurement is to be triggered at a low-high flank (0) or a high-low flank (1).

Your selections for trigger delay and trigger level must be separated by space (20h) (see → 11. "Transmission Protocol")!

Baud Rate (BR)

For baud rate, the following settings are available: 2400, 4800, 9600, 19200, 38400. Faulty inputs are automatically rounded to the nearest available baud rate. The data format is fixed. It includes eight data bits, no parity and one stop bit.

Autostart (AS)

Allows you to define a function which the LDM 40 A is to carry out when voltage supply becomes available. Possible inputs are: Any function that outputs a measured value and ID command.

For example, if ASDT has been parameterised, the LDM 40 A will start with distance tracking immediately after power is available.

Distance Offset (OF)

With the help of this parameter the user may conveniently define a zero point of his/her measuring setup.

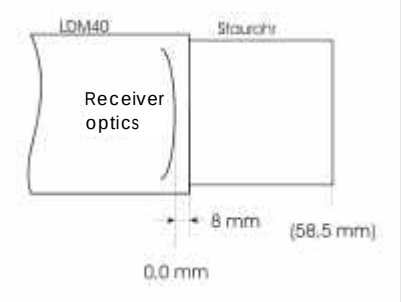


Figure 4 Front edge of LDM 40 A

Zero point of the LDM 40 A (OF = 0.000000e+00) coincides with the front edge of the receiving lens.

Error Mode (SE)

SE (error mode) allows you to configure the behaviour of the digital switching output (alarm) and/or the analog output following an error message (E15, E16, E17). Depending on the particular LDM 40 application environment, error messages have to be handled in different ways. While errors must be detected in some applications, they may be ignored in others.

In order to provides an error management option for users, an SE parameter (error mode) has been implemented in firmware version 1.04 (and following). Available setting options are 0, 1 and 2 with the following effects in the case of an error:

SE	Digital switching output	Analog output
0	Hold voltage level of latest valid measurement	Outputs current of latest valid measurement
1	Positive alarm hysteresis = LOW Negative alarm hysteresis = HIGH	Output current value = 4 mA
2	Positive alarm hysteresis = HIGH Negative alarm hysteresis = LOW	Output current value = 20 mA

10. Functions

Command for Distance Measurement

Function	Command	Meaning
Distance Measurement	DM	single distance measurement
Distance Tracking	DT	continuous distance measurement
Distance Tracking for White Target	DW	continuous distance measurement 10 Hz
Distance Tracking with Trigger	DF	continuous distance measurement with trigger synchronisation

Please use this command for the Autostart Command (e.g. ASDT).

Distance Measurement (DM)

Starts a single distance measurement.

Distance Tracking (DT)

Starts the continuous distance measurement (rate see parameter "ST"). ESC stops the measurement.

Distance Tracking for White Target (DW)

For a constant measuring rate of 10 Hz, a white target board must be affixed to the target. ESC stops the measurement.

Distance Tracking with Trigger (DF)

Starts the continuous distance measurement mode. The beginning of every measurement is synchronously to the input TRIG (see → Parameter "Trigger delay TD"). ESC stops the measurement.

Output and Input

Digital Switching Output (Alarm)

The purpose of the digital switching output is to allow monitoring of targets or scenes for positive or negative edge of a user parametrizable distance threshold.

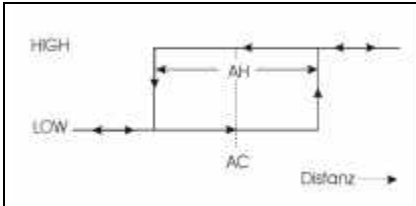


Figure 5 Alarm hysteresis, positive

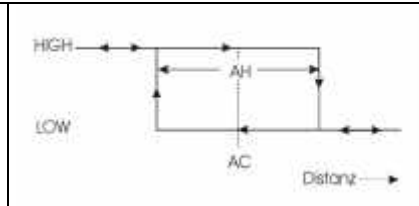


Figure 6 Alarm hysteresis, negative

Configuration is performed by choosing appropriate settings for "Alarm Hysteresis" and "Alarm Centre".

The logic state of the switching output essentially depends on the mathematical sign of your hysteresis setting.

If the setting for hysteresis is positive, the output will switch to high on positive edge of the switching threshold + hysteresis/2 and to low on negative edge of the switching threshold - hysteresis/2.

If the setting for hysteresis is negative, the output will switch to low on positive edge of the switching threshold + hysteresis/2 and to high on negative edge of the switching threshold - hysteresis/2.

Example:

AC	AH	0.8 m	0.9 m	1.0 m	1.1 m	1.2 m	1.1 m	1.0 m	0.9 m	0.8 m
1 m	(+) 0.2m	L	L	L	H	H	H	H	H	L
1 m	- 0.2 m	H	H	H	L	L	L	L	L	H

L = low, H = high, with distance increasing from left to right

Analog Output

The analog output allows a standardised long-distance transmission of analog distance data with the help of a two-wire cable.

The level of current which is output to this cable is proportional to the measured distance value within a distance interval that is defined by "Range Beginning" and "Range End".

The output current value (in mA) can be calculated according to this equation:

$$I_{OUT} = 4 \text{ mA} + 16 \cdot \left(\frac{\text{Distance Value} - \text{Range Begin}}{\text{Range End} - \text{Range Begin}} \right) \text{ mA}$$

Where these calculation rules would results an output current less than 4 mA or more then 20 mA, the corresponding limit value, i.e. 20 mA and 4 mA will be output.

Example:

RB	RE	0 m	2 m	4 m	6 m	8 m	10 m	11 m
2 m	10 m	4 mA	4 mA	8 mA	12 mA	16 mA	20 mA	20 mA

Remote Triggering

This function allows distance measurement to be triggered with an external signal in the form of a 5 V voltage pulse.

The user may configure a desired delay time and a pulse flank he/she wants to use for triggering (see section → "Trigger Delay (TD)").

Having done this, he/she must switch the LDM 40 A to remote triggering mode.

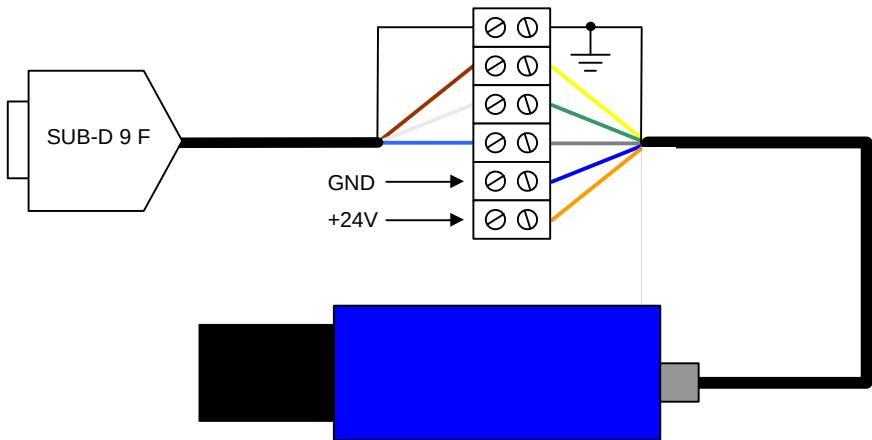
11. Transmission Protocol

ASCII string	Completion	Description
ID	Enter (0Dh)	Calls up a list of commands
DT	Enter (0Dh)	Starts distance tracking
DF	Enter (0Dh)	Distance measurement mode with remote triggering
DM	Enter (0Dh)	Single distance measurement
DW	Enter (0Dh)	Starts distance tracking with white target
TP	Enter (0Dh)	Inner temperature [°C]
SA	Enter (0Dh)	Sets / displays time to measure 0...25
SE	Enter (0Dh)	Sets / displays error mode
SF	Enter (0Dh)	Sets / displays scale factor
AC	Enter (0Dh)	Sets / displays alarm centre [m]
AH	Enter (0Dh)	Sets / displays alarm hysteresis [m]
RB	Enter (0Dh)	Sets / displays distance [m] for Iout = 4 mA
RE	Enter (0Dh)	Sets / displays distance [m] for Iout = 20 mA
TD	Enter (0Dh)	Sets / displays trigger delay [ms] and trigger level
BR	Enter (0Dh)	Sets / displays baud rate (1200...38400)
AS	Enter (0Dh)	Sets / displays Autostart command
OF	Enter (0Dh)	Sets / displays distance offset
LO	Enter (0Dh)	Turns the laser on
LF	Enter (0Dh)	Turns the laser off
PA	Enter (0Dh)	Displays parameter
PR	Enter (0Dh)	Resets parameter

12. Error Messages

Code	Description	Action
E15	Reflexes are too weak or distance between LDM 40 A (front edge) and target < 0.1 m	Use target board or increase distance
E16	Reflexes are too strong	Use target board or filter
E17	Too much steady light (e.g. sun)	Use filter or orifice
E23	Temperature below – 10°C	Use heating
E24	Temperature above + 50°C	Use cooling
E31	EEPROM check sum error	Service necessary
E51	Setting of Avalanche voltage is not possible	Service necessary
E52	Laser current too much or Laser is defect	Service necessary
E53	Division by Zero	Service necessary
E54	PLL out of range	Service necessary
E55	Unknown error	Service necessary
E61	Illegal command	Please correct input
E62	SIO parity error	Check data transfer
E63	SIO overflow	Check data transfer
E64	SIO framing error	Check data transfer

13. PC Interface Cable (Option)



RS 232 cable with power supply for LDM 40 A

No.	SUB-D 9 F	Colour code	Designation SUB-D 9 F (PC COM)
	Shield	-	Cable shield
3		brown	TxD
2		white	RxD
5		blue	GND

No.	LDM 40 A	Colour code	Designation LDM 40 A / RS 232
	Shield	-	Cable shield
1		white	ALARM
2		green	TxD / RX+
3		yellow	RxD / RX-
4		grey	GND
5		brown	TRIG
6		orange or pink	VCC
7		blue	GND
8		red	IOUT
9		black	TX-
10		violet	TX+

Please use only high quality shielded cable.

13. Service and Maintenance

To ensure that all functions are regularly checked and your LDM 40 A operates faultlessly over a long period of time, you are advised to have the LDM 40 A laser distance measurement module inspected at our location at annual intervals. If a repair becomes necessary, you should carefully pack and send the LDM 40 A to our local dealer.